AMERICAN ACADEMIC PUBLISHER

INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

ISSN NUMBER: 2692 - 5206 Volume 6. No 01. January ,2026

# RADIOMICS AND QUANTITATIVE IMAGING BIOMARKERS IN PEDIATRIC DISEASES: CURRENT EVIDENCE AND CLINICAL POTENTIAL

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**Abstract**

Radiomics transforms medical images into high-dimensional quantitative data, enabling objective disease characterization. In pediatric imaging, radiomics offers promising applications in oncology, neurology, and pulmonary diseases. This review summarizes current evidence, challenges, and future directions of radiomics in pediatric medicine.

## Introduction

Conventional radiology relies heavily on qualitative interpretation. Radiomics introduces a quantitative paradigm that extracts imaging biomarkers reflecting tissue heterogeneity and disease biology. This approach is particularly valuable in pediatric patients where early and precise diagnosis is essential.

## Radiomics Workflow

The radiomics pipeline includes image acquisition, segmentation, feature extraction, and data analysis. Feature categories include shape, intensity, texture, and wavelet-based parameters.

## Applications in Pediatric Oncology

Radiomics enables tumor characterization, risk stratification, and prediction of treatment response in pediatric brain tumors and solid malignancies.

## Applications in Neurological Disorders

Quantitative imaging biomarkers assist in evaluating neurodevelopmental disorders and monitoring disease progression in pediatric neurology.

## Applications in Pulmonary Diseases

Radiomics provides objective assessment of lung diseases such as bronchopulmonary dysplasia and chronic lung disease of prematurity.

## Clinical Impact

Radiomics supports personalized treatment planning and non-invasive disease monitoring, potentially reducing the need for repeated biopsies.

## Challenges and Limitations

Major challenges include reproducibility of features, lack of standardization, and limited validation studies in pediatric populations.

## Future Perspectives

Integration of radiomics with artificial intelligence and multi-modal clinical data will expand its role in precision pediatrics.

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ISSN NUMBER: 2692 - 5206 Volume 6. No 01. January ,2026

**Conclusion**

Radiomics represents a powerful tool for advancing pediatric imaging and personalized medicine, although further validation is required.

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